tion would best be undertaken by such a central body. The question of publication in particular is one which at the moment is becoming acute. Many of the younger workers in these days of high printing charges find a difficulty in securing facilities for publishing their work, and the same applies to officials who have made a study of the people under their charge. Publishers are unwilling to undertake the risk of publishing this material without a substantial subsidy which the authors are not, as a rule, able to afford. It is well known that at the present moment there is material dealing with the native peoples of our dependencies waiting to appear, which would, when published, be of the greatest value to administrators. Further, in the official publications of the various administrations there is much valuable material waiting to be made more readily accessible to students. The preparation of abstracts or even bibliographies of such material would be an essential function of the bureau. Owing to its position as a centre for the collection and collation of facts, and owing to the fact that it would be in close touch with those who could speak with authority on any and every part of the Empire, however remote, its value as an intelligence bureau would be incalculable, while Government departments, officers in the service of the Crown, missionaries, traders, and others, would naturally turn to it for information and guidance.

A duty of equal or even greater importance, though not so immediately apparent, would fall to this body in the diffusion of anthropological knowledge and the inculcation of an anthropological point of view among the general public. The need for such knowledge is becoming more urgent day by day for the proper understanding of imperial problems which we in this country or those in the Dominions are called upon to face. Further, it is often forgotten that anthropology does not deal exclusively with backward races or with the physical characters of the civilised. The culture and the underlying psychological basis of that culture among civilised races are equally within its scope. Even our own population is as yet a field which, anthropologically speaking, is largely unexplored. As was pointed out by Prof. Patrick Geddes and others at Edinburgh, it is the lack of the anthropological point of view in dealing with our own and other peoples which lies at the base of much of our present troubles.

Chemical Warfare.

The Riddle of the Rhine: Chemical Strategy in Peace and War. By Victor Lefebure. Pp. 279. (London: W. Collins, Sons, and Co., Ltd., 1921.) 10*s*. 6*d*. net.

EVERY great war within the last hundred years has been characterised by some new development in the means of offence, based upon the applications of science. Each successive war, in fact, is, in greater or less degree, a reflex of contemporary scientific knowledge concerning the most effective practicable measures by which belligerents may destroy human life; but it was reserved for the last great war—the greatest of all wars—to witness the introduction of a method of warfare which, in its savage ferocity and in its callous disregard of human suffering, is unparalleled in history. April 22, 1915, when the Germans sent great volumes of the deadly chlorine gas against the Allied lines, is a black-letter day in the annals of warfare. It was thought at first to have been a last desperate effort to dislodge the French from a position which all recognised methods of fighting had failed to take. The truth, however, is now beginning to appear. It was the first trial of a new war method, deliberately conceived and worked out by the Germans, even before the outbreak of war, and in flagrant disregard of their undertaking at the Hague Convention to abstain from the use of asphyxiating or deleterious gases. According to the author of the book before us,

"there is evidence that the Kaiser Wilhelm Institute, and the Physico-chemical Institute near by, were employed for this purpose as early as August, 1914. Reliable authority exists for the statement that soon after this date they were working with cacodyl oxide and phosgene, both well known before the war for their very poisonous nature, for use, it was believed, in hand grenades. Our quotations are from a neutral then working at the Institute. 'We could hear the tests that Professor Haber was carrying out at the back of the Institute, with the military authorities, who in their steel-grey cars came to Haber's Institute every morning.' 'The work was pushed day and night, and many times I saw activity in the building at eleven o'clock in the evening. It was common knowledge that Haber was pushing these men as hard as he could.' Sachur was Professor Haber's assistant. 'One morning there was a violent explosion in the room in which most of this war work was carried out. The room was instantly filled with dense clouds of arsenic oxide.' 'The janitors began to clean the room by a hose and discovered Professor Sachur.' He was very badly hurt and died soon after. 'After that accident I believe the work on cacodyl oxide and phosgene was suspended, and I believe that work was carried out on chlorine or chlorine compounds.' 'There were seven or eight men working in the Institute on these problems, but we heard nothing more until Haber went to the Battle of Ypres.'"

Ludendorff, in his "War Memories," refers to the valuable services of Geheimrat Haber in connection with the use of gas.

That what has come to be known as "chemical warfare" was intended by the Germans to be the novel and distinguishing feature of the war they had so sedulously planned was abundantly proved by its subsequent course. The *liaison* between the German G.H.Q. and the Interessen Gemeinschaft, the organisation which controlled the great chemical manufacturing establishments of Germany, was complete. It was mainly through the agency of the I.G. that in the first place Geheimrat Haber and his colleagues were furnished with the poisonous products they needed for their trials, and it was the I.G. that directed the Badische Anilin- und Sodafabrik at Ludwigshafen, the chemical factory at Berlin, of which the late Dr. Martius was the head, Höchst, Leverkusen, and the rest of the great Rhine dyestuff-producing works, all working in concert, to supply the various lethal substances, eighteen at least, which it was eventually decided to employ. The I.G. organisation was comparatively simple. It lay ready to hand, and could be promptly set in motion with no bureaucratic friction and no official delays. Much of the plant needed to produce synthetic dyes could equally well produce synthetic poisons, and the apparatus was of a type that could be rapidly augmented if necessary.

It was these conditions which, no doubt, in the first instance, led the Germans to plan their new war method. The unique position of their great manufacturing establishments, with their special machinery and experience, their perfect organisation and scientific direction, their intimate co-operation, their hundreds of trained chemists, and their thousands of skilled workmen, gave them an overwhelming advantage over their enemies. The marvel is that they should have ultimately failed. They had the initial advantage of surprise, and at one period it is certain that the way to the coast, which it was their objective to reach, was open to them; but by the mercy of Providence they were made blind to their opportunity, and we all know the sequel. It was that the Allies eventually beat the Germans at their own game.

What we are now concerned to know is whether the game is to continue. Has chemical warfare come to stay? Military experts apparently halt between two opinions. The issue would seem to rest with Germany. This issue will give her pause to think. Those who seek to guide her policy must take stock of her position as the war has left it. Is she in the same strong position now in regard to her organic chemical industry that she occupied prior to 1914? If, with the condition of that industry as it was in all the Allied countries at that period, she yet failed, what chance would she have now? The development of applied organic chemistry in this country, in France, or in America, is not at present all that we might wish to see it, or as assuredly it will be in the not remote future, but it is still very considerable. Each country is immeasurably better able to withstand the German menace of poison gas, and, if necessary, to retaliate with it, than it was half a dozen years ago.

We have learned by experience. The initial advantage of organisation and surprise in the production and military use of poison gas no longer rests with Germany—at least, to nothing like their former extent. She has already paid dearly, both morally and materially, for her breach of the Hague Convention to which she had subscribed, and it is not difficult to suggest means whereby she can be still further penalised should she fail to give adequate assurance, when required, that she means to abandon the new war method she has initiated. Should she be required to abandon it? This is a matter which surely falls within the purview of the Washington Conference on disarmament. The Covenant of the League of Nations has already incidentally dealt with it. Article 8, however, requires to be more explicitly directed to it. Moreover, the power of the League needs to be strengthened to enable it to deal more effectively with breaches of its regulations.

If the German menace were removed there would probably be little difficulty in securing international agreement among members of the League to ratify once more the article of the Hague Convention to "abstain from the use of projectiles the object of which is the diffusion of asphyxiating or deleterious gases." Germany cannot continue to remain outside the League. Sooner or later she will put herself in order and apply to come in. Her national position and her future as a world-Power will require it. Once a member she must subscribe to, and must obey, its conditions. It must rest with the League to enforce, if necessary, Germany's obligations. The loss of the markets of the world for the products the Interessen Gemeinschaft controls might be the least of the penalties she might be made to incur for a breach of them.

The whole story of the inception and development of gas warfare by Germany has still to be told. Schwartes's book, "Die Technik im Weltkriege," throws some light on the subject from the German side, and we have references to it in such works as Ludendorff's "War Memories." The report of the Hartley mission to the German chemical factories in the occupied zone, and Gen. Hartley's report to the British Association, taught us much and revealed the intimate association of the all-powerful I.G. with the German War Department. Major Lefebure, in the work under review, has undoubtedly made the most considerable contribution to the history of chemical warfare which has yet appeared. He has described its rise, the nature of the various lethal substances employed, the modes of protection, the efforts of the Allies to retaliate, the successive attempts to secure the initiative, and chemical warfare organisation in Germany, in this country, and in America. He has said comparatively little respecting France, but its story has been admirably told by Prof. Moureu in his "La Chimie et la Guerre," already noticed in these columns.

The weakest point of Major Lefebure's book is its constructive policy. He proposes to counter the German menace by breaking down the German monopoly in the manufacture of synthetic dyestuffs. This, he says, can be done only by what he calls "a redistribution of organic chemical forces. This, indeed, is the one solid chemical disarmament measure which can and must be brought about." But how? By interfering with "the play of ordinary economic laws." Who is to interfere? The League of Nations. Surely this is not even a counsel of perfection. Nobody, however powerful, can long resist the play of ordinary economic laws. As somebody has observed, the result would be that the economic laws would come back at you like a punch-ball.

T. E. THORPE.

Alfred Newton, Ornithologist.

Life of Alfred Newton, Professor of Comparative Anatomy, Cambridge University, 1866–1907. By A. F. R. Wollaston. With a preface by Sir Archibald Geikie. Pp. xv+332. (London: John Murray, 1921.) 18*s*. net.

DURING the fourteen years that have elapsed since the death of Prof. Newton many of the older members of his circle who had eagerly anticipated the perusal of this volume have passed away, but every British ornithologist will welcome an account of one who for half a century was the leading exponent of the science in this country—one, too, whose remarkable influence in all matters relating to the study of bird-life can be fully realised and appreciated only by those who had the good fortune to participate in his friendship. As Prof. Newton kept voluminous journals and seldom destroyed a letter, the work, as Sir Archibald Geikie points out in his preface, has been given largely the character of an autobiography. With this wealth of material at his disposal, it is greatly to be regretted that the author has found it necessary, owing to the increased costs of publication, to reduce the volume by nearly half its bulk, and we feel certain that a bolder policy in this respect would have entailed no loss. Mr. Wollaston, however, has made a careful selection of his material, and has succeeded in producing a vivid picture of the varied activities and interests of a life of such fullness as is vouchsafed to but few, drawn from the professor's own letters and journals, and from the correspondence and recollections of those who were intimately associated with him.

Students of the history of zoology in this country will find much new information in the chapters dealing with the foundation, in Newton's rooms at Cambridge in 1858, of the British Ornithologists' Union and its journal, *The Ibis,* and with the part played by Newton in the early promulgation of the doctrines of Darwin and Wallace.

Much may be learned from the glimpses that are given us of Newton's methods of work and of the extraordinary pains he took to ensure that perfect accuracy, even in the smallest details, which characterises everything that he published, and renders it as perfect as human effort could make it at the time. His greatest work, the "Dictionary of Birds," displays research and scholarship unparalleled in ornithological literature, and must ever remain one of the classics of the science. Newton's desire for completeness prevented the publication of works on the great auk or garefowl, and the history of the great bustard in Britain, for which he had been collecting material for many years. It is to be hoped that the attention now directed to this vast store of material may lead to its speedy editing and publication.

Space will only permit of a reference to the character-sketch contributed by Dr. F. H. H. Guillemard. Here we see the professor in his study in the Old Lodge at Magdalene—"the nest in which *The Ibis* was fledged"—where every Sunday evening he was at home to any member of the university who was interested in zoology. It was here, rather than in the lecture room, that his influence on zoological thought at Cambridge was exerted. To quote the apt remark of Sir A. Shipley, "Newton's Sunday evenings saved zoology as the science of living animals in Cambridge."

W. E. C.

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